



010830-118.ST25

SEQUENCE LISTING

<110> Guerin-Marchand, Claudine
Druilhe, Pierre

<120> Peptide Sequences Specific for the Hepatic Stages of P. Falciparum
Bearing Epitopes Capable of Stimulating the T Lymphocytes

<130> 010830-118

<140> US 09/900,963
<141> 2001-07-10

<150> US 08/098,327
<151> 1993-11-24

<150> PCT/FR92/00104
<151> 1992-02-05

<150> FR 91 01286
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Leu															

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Leu	Gln	Xaa	Gln	Gln	Xaa	Asp	Leu	Glu	Gln	Xaa	Arg	Xaa	Ala	Lys	Glu
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1
Glu

5

10

15

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Glu Lys Leu Gln Xaa Gln Gln Xaa Asp Leu Glu Gln Xaa Arg Xaa Ala

1
Lys

5

10

15

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Xaa

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 20 25 30
 Glu Leu Pro Ser Glu Asn Glu Arg Gly Tyr Tyr Ile Pro His Gln Ser
 35 40 45
 Ser Leu Pro Gln Asp Asn Arg Gly Asn Ser Arg Asp Ser Lys Glu Ile
 50 55 60
 Ser Ile Ile Glu Lys Thr Asn Arg Glu Ser Ile Thr Thr Asn Val Glu

65 70 75 80
 Gly Arg Arg Asp Ile His Lys Gly His Leu Glu Glu Lys Lys Asp Gly
 85 90 95
 Ser Ile Lys Pro Glu Gln Lys Glu Asp Lys Ser
 100 105

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 Lys Asn Leu Glu Arg Lys Lys Glu His Gly Asp Ile Leu Ala Glu Asp
 20 25 30
 Leu Tyr Gly Arg Leu Glu Ile Pro Ala Ile Glu Leu Pro Ser Glu Asn
 35 40 45
 Glu Arg Gly Tyr Tyr Ile Pro His Gln Ser Ser Leu Pro Gln Asp Asn
 50 55 60
 Arg Gly Asn Ser Arg Asp Ser Lys Glu Ile Ser Ile Ile Glu Lys Thr
 65 70 75 80
 Asn Arg Glu Ser Ile Thr Thr Asn Val Glu Gly Arg Arg Asp Ile His
 85 90 95
 Lys Gly His Leu Glu Glu Lys Lys Asp Gly Ser Ile Lys Pro Glu Gln
 100 105 110
 Lys Glu Asp Lys Ser
 115

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 Ala Glu Asp Leu Tyr Gly Arg Leu Glu Ile Pro
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1 5 10 15
 Gln Arg Lys Ala Asp Thr Lys Lys
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<400> 23
 Asn Ser Arg Asp Ser Lys Glu Ile Ser Ile Ile Glu Lys Thr Asn Arg
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 Glu Ser Ile Thr Thr Asn Val Glu Gly Arg Arg Asp Ile His Lys
 20 25 30

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 Glu Val Lys Glu Asn Ile Leu Glu Glu Ser Gln Val Asn Asp Asp Ile
 20 25 30
 Phe Asn Ser Leu Val Lys Ser Val Gln Gln Glu Gln Gln His Asn Val
 35 40 45
 Glu Glu Lys Val Glu Glu Ser Val Glu Glu Asn Asp Glu Glu Ser Val
 50 55 60
 Glu Glu Asn Val Glu Glu Asn Val Glu Glu Asn Asp Asp Gly Ser Val
 65 70 75 80
 Ala Ser Ser Val Glu Glu Ser Ile Ala Ser Ser Val Asp Glu Ser Ile
 85 90 95
 Asp Ser Ser Ile Glu Glu Asn Val Ala Pro Thr Val Glu Glu Ile Val
 100 105 110
 Ala Pro Thr Val Glu Glu Ile Val Ala Pro Ser Val Val Glu Lys Cys
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 130 135 140
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 145 150

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 1          5          10          15
Glu Val Lys Glu Asn Ile Leu Glu Glu Ser Gln Val Asn Asp Asp Ile
          20          25          30
Phe Asn Ser Leu Val Lys Ser Val Gln Gln Glu Gln Gln His Asn
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Val Lys Glu Asn Ile Leu Glu Glu Ser Gln
          20          25

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Lys Ser Val Gln Gln Glu Gln Gln His Asn Val
          20          25

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Glu Glu Ser Val Ala Glu Met Leu Lys Glu Arg
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20 25 30
Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln
35 40 45
Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu
50 55 60
Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys
65 70 75 80
Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Asp Arg Leu Ala Lys Glu
85 90 95
Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala Lys
100 105 110
Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala
115 120 125
Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg
130 135 140
Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg
145 150 155 160
Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu
165 170 175
Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln
180 185 190
Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Arg Asp Leu Glu
195 200 205
Gln Arg Lys Ala Asp Thr Lys Lys Asn Leu Glu Arg Lys Lys Glu His
210 215 220
Gly Asp Ile Leu Ala Glu Asp Leu Tyr Gly Arg Leu Glu Ile Pro Ala
225 230 235 240
Ile Glu Leu Pro Ser Glu Asn Glu Arg Gly Tyr Tyr Ile Pro His Gln
245 250 255
Ser Ser Leu Pro Gln Asp Asn Arg Gly Asn Ser Arg Asp Ser Lys Glu

<223> Liver Stage Specific antigen

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aaaaagatga aatcataaaa tctaacttga gaagtgggtc ttcaaattct aggaatcgaa 180
taaagtagga aaatcacgag aagaaacacg ttttatctca taattcatat gagaaaacta 240
aaaataatga aaataataaa tttttcgata aggataaaga gttaacgatg tctaattgtaa 300
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aagaaaaagc agctaaagaa aagttacagg ggcaacaaag cgattcagaa caagagagac 540
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atgaaacata tt

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<210> 36

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<400> 36

aagcgattta ga

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Met Lys His Ile Leu Tyr Ile Ser Phe Tyr Phe Ile Leu Val Asn Leu
1           5           10           15

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ttg ata ttt cat ata aat gga aag ata ata aag aat tct gaa aaa gat 96

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Leu	Ile	Phe	His	Ile	Asn	Gly	Lys	Ile	Ile	Lys	Asn	Ser	Glu	Lys	Asp		
			20					25					30				
gaa	atc	ata	aaa	tct	aac	ttg	aga	agt	ggg	tct	tca	aat	tct	agg	aat	144	
Glu	Ile	Ile	Lys	Ser	Asn	Leu	Arg	Ser	Gly	Ser	Ser	Asn	Ser	Arg	Asn		
		35					40					45					
cga	ata	aat	gag	gaa	aat	cac	gag	aag	aaa	cac	gtt	tta	tct	cat	aat	192	
Arg	Ile	Asn	Glu	Glu	Asn	His	Glu	Lys	Lys	His	Val	Leu	Ser	His	Asn		
	50					55					60						
tca	tat	gag	aaa	act	aaa	aat	aat	gaa	aat	aat	aaa	ttt	ttc	gat	aag	240	
Ser	Tyr	Glu	Lys	Thr	Lys	Asn	Asn	Glu	Asn	Asn	Lys	Phe	Phe	Asp	Lys		
65					70					75					80		
gat	aaa	gag	tta	acg	atg	tct	aat	gta	aaa	aat	gtg	tca	caa	aca	aat	288	
Asp	Lys	Glu	Leu	Thr	Met	Ser	Asn	Val	Lys	Asn	Val	Ser	Gln	Thr	Asn		
				85					90					95			
ttc	aaa	agt	ctt	tta	aga	aat	ctt	ggg	gtt	tca	gag	aat	ata	ttc	ctt	336	
Phe	Lys	Ser	Leu	Leu	Arg	Asn	Leu	Gly	Val	Ser	Glu	Asn	Ile	Phe	Leu		
			100					105					110				
aaa	gaa	aat	aaa	tta	aat	aag	gaa	ggg	aaa	tta	att	gaa	cac	ata	ata	384	
Lys	Glu	Asn	Lys	Leu	Asn	Lys	Glu	Gly	Lys	Leu	Ile	Glu	His	Ile	Ile		
		115					120					125					
aat	gat	gat	gac	gat	aaa	aaa	aaa	tat	att	aaa	ggg	caa	gac	gaa	aac	432	
Asn	Asp	Asp	Asp	Asp	Lys	Lys	Lys	Tyr	Ile	Lys	Gly	Gln	Asp	Glu	Asn		
	130					135					140						
aga	caa	gaa	gat	ctt	gaa	gaa	aaa	gca	gct	aaa	gaa	aag	tta	cag	ggg	480	
Arg	Gln	Glu	Asp	Leu	Glu	Glu	Lys	Ala	Ala	Lys	Glu	Lys	Leu	Gln	Gly		
145					150				155						160		
caa	caa	agc	gat	tca	gaa	caa	gag	aga	cgt	gct	aaa	gaa	aag	ttg	caa	528	
Gln	Gln	Ser	Asp	Ser	Glu	Gln	Glu	Arg	Arg	Ala	Lys	Glu	Lys	Leu	Gln		
				165					170					175			
gaa	caa	caa	agc	gat	tta	gaa	caa	gag	aga	ctt	gct	aaa	gaa	aag	ttg	576	
Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Leu	Ala	Lys	Glu	Lys	Leu		
			180					185					190				
caa	gaa	caa	caa	agc	gat	tta	gaa	caa	gag	aga	cgt	gct	aaa	gaa	aag	624	
Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg	Ala	Lys	Glu	Lys		
		195					200					205					
ttg	caa	gaa	caa	caa	agc	gat	tta	gaa	caa	gag	aga	ctt	gct	aaa	gaa	672	
Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Leu	Ala	Lys	Glu		
	210					215					220						
aag	ttg	caa	gaa	caa	caa	agc	gat	tta	gaa	caa	gag	aga	cgt	gct	aaa	720	
Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg	Ala	Lys		
225					230					235					240		
gaa	aag	ttg	caa	gaa	caa	caa	agc	gat	tta	gaa	caa	gag	aga	cgt	gct	768	
Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg	Ala		
				245					250					255			

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aaa gaa aag ttg caa gaa caa caa agc gat tta gaa caa gag aga ctt      816
Lys Glu Lys  Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Leu
                260                      265                      270

gct aaa gaa aag tta caa gag cag caa agc gat tta gaa caa gat aga      864
Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Asp Arg
                275                      280                      285

ctt gct aaa gaa aag ttg caa gaa caa caa agc gat tta gaa caa gag      912
Leu Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu
                290                      295                      300

aga cgt gct aaa gaa agg ttg caa gaa caa caa agc gat tta              954
Arg Arg Ala Lys Glu Arg Leu Gln Glu Gln Gln Ser Asp Leu
305                      310                      315

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<210> 38
 <211> 318
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Liver Stage Specific antigen

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<400> 38
Met Lys His Ile Leu Tyr Ile Ser Phe Tyr Phe Ile Leu Val Asn Leu
 1          5          10          15
Leu Ile Phe His Ile Asn Gly Lys Ile Lys Asn Ser Glu Lys Asp
                20          25          30
Glu Ile Ile Lys Ser Asn Leu Arg Ser Gly Ser Ser Asn Ser Arg Asn
 35          40          45
Arg Ile Asn Glu Glu Asn His Glu Lys Lys His Val Leu Ser His Asn
 50          55          60
Ser Tyr Glu Lys Thr Lys Asn Asn Glu Asn Asn Lys Phe Phe Asp Lys
 65          70          75          80
Asp Lys Glu Leu Thr Met Ser Asn Val Lys Asn Val Ser Gln Thr Asn
                85          90          95
Phe Lys Ser Leu Leu Arg Asn Leu Gly Val Ser Glu Asn Ile Phe Leu
                100          105          110
Lys Glu Asn Lys Leu Asn Lys Glu Gly Lys Leu Ile Glu His Ile Ile
                115          120          125
Asn Asp Asp Asp Asp Lys Lys Lys Tyr Ile Lys Gly Gln Asp Glu Asn
                130          135          140
Arg Gln Glu Asp Leu Glu Glu Lys Ala Ala Lys Glu Lys Leu Gln Gly
 145          150          155          160
Gln Gln Ser Asp Ser Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln
                165          170          175
Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Leu Ala Lys Glu Lys Leu
                180          185          190
Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys
                195          200          205
Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Leu Ala Lys Glu
                210          215          220
Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala Lys
 225          230          235          240
Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala
                245          250          255

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Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Leu
 260 265 270
 Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Asp Arg
 275 280 285
 Leu Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu
 290 295 300
 Arg Arg Ala Lys Glu Arg Leu Gln Glu Gln Gln Ser Asp Leu
 305 310 315

<210> 39
 <211> 1493
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Liver Stage Specific antigen

<400> 39
 caagaacaac aaagcgatct agaacaagag agacgtgcta aagaaaagtt gcaagaacaa 60
 caaagcgatt tagaacaaga tagacttgct aaagaaaagt tacaagagca gcaaagcgat 120
 ttagaacaag agagacttgc taagaaaagt tgcaagaaca acaaagcgat ctagaacaag 180
 agagacgtgc taaagaaaag ttgcaagaac aacaaagcga tttagaacaa gagagacgtg 240
 ctaaagaaaa gttgcaagaa caacaaagcg atttagaaca agatagactt gctaaagaaa 300
 agttacaaga gcagcaaagc gatttagaac aagagagacg tgctaaagaa aagttgcaag 360
 aacaacaaag cgatttagaa caagagagac gtgctaagaa aagttgcaag aacaacaaag 420
 cgatttagaa caagagagac ttgctaagaa aaagttgcaa gaacaacaaa gcgatttaga 480
 acaagagaga cgtgctaag aaagttgca agaacaacaa agcgatttag aacaagagag 540
 acgtgctaag aaaagttgca agaacaacaa agcgatttag aacaagagag acgtgctaaa 600
 gaaaagttgc aagagcagca aagagattta gaacaaagga aggctgatac gaaaaaaaat 660
 ttagaagaaa aaaaggaaca tggagatata ttagcagagg atttatatgg tcgtttagaa 720
 ataccagcta tagaacttcc atcagaaaat gaacgtggat atttatatac acatcaatct 780
 tctttacctc aggacaacag agggaatagt agagattcca aggaaatatc tataatagaa 840
 aaaacaaata gagaatctat tacaacaaat gttgaaggac gaagggatat acataaagga 900
 catcttgaag aaaagaaaga tggttcaata aaaccagaac aaaaagaaga taaatctgct 960
 gacatacaaa atcatacatt agagacagta aatatttctg atgttaatga ttttcaaata 1020
 agtaagtatg aggatgaaat aagtgtctgaa tatgacgatt cattaataga tgaagaagaa 1080
 gatgatgaag acttagacga atttaagcct attgtgcaat atgacaattt ccaagatgaa 1140
 gaaaacatag gaatttataa agaactagaa gatttgatag agaaaaatga aaatttagat 1200
 gatttagatg aaggaataga aaaatcatca gaagaattat ctgaagaaaa aataaaaaaa 1260
 ggaaagaaat atgaaaaaac aaaggataat aatttttaaac caaatgataa aagtttgtat 1320
 gatgagcata ttaaaaaata taaaaatgat aagcagggtta ataaggaaaa ggaaaaattc 1380
 ataaaatcat tgtttcatat atttgacgga gacaatgaaa ttttacagat cgtggatgag 1440
 ttatctgaag atataactaa atattttatg aaactataaa aggttatata ttt 1493

<210> 40
 <211> 12
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Liver Stage Specific antigen

<400> 40
 caagaacaac aa 12

<210> 41
 <211> 12
 <212> DNA

<213> Artificial Sequence

<220>

<223> Liver Stage Specific antigen

<400> 41

ggttatatat tt

12

<210> 42

<211> 1494

<212> DNA

<213> Artificial Sequence

<220>

<223> Liver Stage Specific antigen

<221> CDS

<222> (1)...(1494)

<400> 42

caa	gaa	caa	caa	agc	gat	cta	gaa	caa	gag	aga	cgt	gct	aaa	gaa	aag	48
Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg	Ala	Lys	Glu	Lys	
1				5					10					15		

ttg	caa	gaa	caa	caa	agc	gat	tta	gaa	caa	gat	aga	ctt	gct	aaa	gaa	96
Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Asp	Arg	Leu	Ala	Lys	Glu	
			20						25				30			

aag	tta	caa	gag	cag	caa	agc	gat	tta	gaa	caa	gag	aga	ctt	gct	aaa	144
Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Leu	Ala	Lys	
		35					40					45				

gaa	aag	ttg	caa	gaa	caa	caa	agc	gat	cta	gaa	caa	gag	aga	cgt	gct	192
Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg	Ala	
	50					55						60				

aaa	gaa	aag	ttg	caa	gaa	caa	caa	agc	gat	tta	gaa	caa	gag	aga	cgt	240
Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg	
	65				70					75					80	

gct	aaa	gaa	aag	ttg	caa	gaa	caa	caa	agc	gat	tta	gaa	caa	gat	aga	288
Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Asp	Arg	
			85						90					95		

ctt	gct	aaa	gaa	aag	tta	caa	gag	cag	caa	agc	gat	tta	gaa	caa	gag	336
Leu	Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	
		100						105					110			

aga	cgt	gct	aaa	gaa	aag	ttg	caa	gaa	caa	caa	agc	gat	tta	gaa	caa	384
Arg	Arg	Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	
		115					120					125				

gag	aga	cgt	gct	aaa	gaa	aag	ttg	caa	gaa	caa	caa	agc	gat	tta	gaa	432
Glu	Arg	Arg	Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	
	130					135					140					

caa	gag	aga	ctt	gct	aaa	gaa	aag	ttg	caa	gaa	caa	caa	agc	gat	tta	480
Gln	Glu	Arg	Leu	Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	
145					150					155					160	

gaa caa gag aga cgt gct aaa gaa aag ttg caa gaa caa caa agc gat	528
Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp	
165 170 175	
tta gaa caa gag aga cgt gct aaa gaa aag ttg caa gaa caa caa agc	576
Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser	
180 185 190	
gat tta gaa caa gag aga cgt gct aaa gaa aag ttg caa gag cag caa	624
Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln	
195 200 205	
aga gat tta gaa caa agg aag gct gat acg aaa aaa aat tta gaa aga	672
Arg Asp Leu Glu Gln Arg Lys Ala Asp Thr Lys Lys Asn Leu Glu Arg	
210 215 220	
aaa aag gaa cat gga gat ata tta gca gag gat tta tat ggt cgt tta	720
Lys Lys Glu His Gly Asp Ile Leu Ala Glu Asp Leu Tyr Gly Arg Leu	
225 230 235 240	
gaa ata cca gct ata gaa ctt cca tca gaa aat gaa cgt gga tat tat	768
Glu Ile Pro Ala Ile Glu Leu Pro Ser Glu Asn Glu Arg Gly Tyr Tyr	
245 250 255	
ata cca cat caa tct tct tta cct cag gac aac aga ggg aat agt aga	816
Ile Pro His Gln Ser Ser Leu Pro Gln Asp Asn Arg Gly Asn Ser Arg	
260 265 270	
gat tcc aag gaa ata tct ata ata gaa aaa aca aat aga gaa tct att	864
Asp Ser Lys Glu Ile Ser Ile Ile Glu Lys Thr Asn Arg Glu Ser Ile	
275 280 285	
aca aca aat gtt gaa gga cga agg gat ata cat aaa gga cat ctt gaa	912
Thr Thr Asn Val Glu Gly Arg Arg Asp Ile His Lys Gly His Leu Glu	
290 295 300	
gaa aag aaa gat ggt tca ata aaa cca gaa caa aaa gaa gat aaa tct	960
Glu Lys Lys Asp Gly Ser Ile Lys Pro Glu Gln Lys Glu Asp Lys Ser	
305 310 315 320	
gct gac ata caa aat cat aca tta gag aca gta aat att tct gat gtt	1008
Ala Asp Ile Gln Asn His Thr Leu Glu Thr Val Asn Ile Ser Asp Val	
325 330 335	
aat gat ttt caa ata agt aag tat gag gat gaa ata agt gct gaa tat	1056
Asn Asp Phe Gln Ile Ser Lys Tyr Glu Asp Glu Ile Ser Ala Glu Tyr	
340 345 350	
gac gat tca tta ata gat gaa gaa gaa gat gat gaa gac tta gac gaa	1104
Asp Asp Ser Leu Ile Asp Glu Glu Glu Asp Asp Glu Asp Leu Asp Glu	
355 360 365	
ttt aag cct att gtg caa tat gac aat ttc caa gat gaa gaa aac ata	1152
Phe Lys Pro Ile Val Gln Tyr Asp Asn Phe Gln Asp Glu Glu Asn Ile	
370 375 380	
gga att tat aaa gaa cta gaa gat ttg ata gag aaa aat gaa aat tta	1200
Gly Ile Tyr Lys Glu Leu Glu Asp Leu Ile Glu Lys Asn Glu Asn Leu	
385 390 395 400	

gat gat tta gat gaa gga ata gaa aaa tca tca gaa gaa tta tct gaa	1248
Asp Asp Leu Asp Glu Gly Ile Glu Lys Ser Ser Glu Glu Leu Ser Glu	
405 410 415	
gaa aaa ata aaa aaa gga aag aaa tat gaa aaa aca aag gat aat aat	1296
Glu Lys Ile Lys Lys Gly Lys Lys Tyr Glu Lys Thr Lys Asp Asn Asn	
420 425 430	
ttt aaa cca aat gat aaa agt ttg tat gat gag cat att aaa aaa tat	1344
Phe Lys Pro Asn Asp Lys Ser Leu Tyr Asp Glu His Ile Lys Lys Tyr	
435 440 445	
aaa aat gat aag cag gtt aat aag gaa aag gaa aaa ttc ata aaa tca	1392
Lys Asn Asp Lys Gln Val Asn Lys Glu Lys Glu Lys Phe Ile Lys Ser	
450 455 460	
ttg ttt cat ata ttt gac gga gac aat gaa att tta cag atc gtg gat	1440
Leu Phe His Ile Phe Asp Gly Asp Asn Glu Ile Leu Gln Ile Val Asp	
465 470 475 480	
gag tta tct gaa gat ata act aaa tat ttt atg aaa cta taa aag gtt	1488
Glu Leu Ser Glu Asp Ile Thr Lys Tyr Phe Met Lys Leu * Lys Val	
485 490 495	
ata tat	1494
Ile Tyr	

<210> 43
 <211> 497
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Liver Stage Specific antigen

<400> 43

Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys	
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Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Asp Arg Leu Ala Lys Glu	
20 25 30	
Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Leu Ala Lys	
35 40 45	
Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala	
50 55 60	
Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg	
65 70 75 80	
Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Asp Arg	
85 90 95	
Leu Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu	
100 105 110	
Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln	
115 120 125	
Glu Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu	
130 135 140	
Gln Glu Arg Leu Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu	
145 150 155 160	

Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp
 165 170 175
 Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser
 180 185 190
 Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln
 195 200 205
 Arg Asp Leu Glu Gln Arg Lys Ala Asp Thr Lys Lys Asn Leu Glu Arg
 210 215 220
 Lys Lys Glu His Gly Asp Ile Leu Ala Glu Asp Leu Tyr Gly Arg Leu
 225 230 235 240
 Glu Ile Pro Ala Ile Glu Leu Pro Ser Glu Asn Glu Arg Gly Tyr Tyr
 245 250 255
 Ile Pro His Gln Ser Ser Leu Pro Gln Asp Asn Arg Gly Asn Ser Arg
 260 265 270
 Asp Ser Lys Glu Ile Ser Ile Ile Glu Lys Thr Asn Arg Glu Ser Ile
 275 280 285
 Thr Thr Asn Val Glu Gly Arg Arg Asp Ile His Lys Gly His Leu Glu
 290 295 300
 Glu Lys Lys Asp Gly Ser Ile Lys Pro Glu Gln Lys Glu Asp Lys Ser
 305 310 315 320
 Ala Asp Ile Gln Asn His Thr Leu Glu Thr Val Asn Ile Ser Asp Val
 325 330 335
 Asn Asp Phe Gln Ile Ser Lys Tyr Glu Asp Glu Ile Ser Ala Glu Tyr
 340 345 350
 Asp Asp Ser Leu Ile Asp Glu Glu Glu Asp Asp Glu Asp Leu Asp Glu
 355 360 365
 Phe Lys Pro Ile Val Gln Tyr Asp Asn Phe Gln Asp Glu Glu Asn Ile
 370 375 380
 Gly Ile Tyr Lys Glu Leu Glu Asp Leu Ile Glu Lys Asn Glu Asn Leu
 385 390 395 400
 Asp Asp Leu Asp Glu Gly Ile Glu Lys Ser Ser Glu Glu Leu Ser Glu
 405 410 415
 Glu Lys Ile Lys Lys Gly Lys Lys Tyr Glu Lys Thr Lys Asp Asn Asn
 420 425 430
 Phe Lys Pro Asn Asp Lys Ser Leu Tyr Asp Glu His Ile Lys Lys Tyr
 435 440 445
 Lys Asn Asp Lys Gln Val Asn Lys Glu Lys Glu Lys Phe Ile Lys Ser
 450 455 460
 Leu Phe His Ile Phe Asp Gly Asp Asn Glu Ile Leu Gln Ile Val Asp
 465 470 475 480
 Glu Leu Ser Glu Asp Ile Thr Lys Tyr Phe Met Lys Leu Lys Val Ile
 485 490 495
 Tyr

<210> 44
 <211> 12
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Liver Stage Specific antigen

<400> 44
 caagaacaac aa

12

<210> 45
 <211> 12

<212> DNA
 <213> Artificial Sequence

<220>
 <223> Liver Stage Specific antigen

<400> 45
 atgaaactat aa 12

<210> 46
 <211> 1494
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Liver Stage Specific antigen

<221> CDS
 <222> (1)...(1494)

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ttg caa gaa caa caa agc gat tta gaa caa gat aga ctt gct aaa gaa 96
 Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Asp Arg Leu Ala Lys Glu
 20 25 30

aag tta caa gag cag caa agc gat tta gaa caa gag aga ctt gct aaa 144
 Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Leu Ala Lys
 35 40 45

gaa aag ttg caa gaa caa caa agc gat cta gaa caa gag aga cgt gct 192
 Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg Ala
 50 55 60

aaa gaa aag ttg caa gaa caa caa agc gat tta gaa caa gag aga cgt 240
 Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu Arg Arg
 65 70 75 80

gct aaa gaa aag ttg caa gaa caa caa agc gat tta gaa caa gat aga 288
 Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Asp Arg
 85 90 95

ctt gct aaa gaa aag ttg caa gag cag caa agc gat tta gaa caa gag 336
 Leu Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln Glu
 100 105 110

aga cgt gct aaa gaa aag ttg caa gaa caa caa agc gat tta gaa caa 384
 Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu Gln
 115 120 125

gag aga cgt gct aaa gaa aag ttg caa gaa caa caa agc gat tta gaa 432
 Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu Glu
 130 135 140

caa gag aga ctt gct aaa gaa aag ttg caa gaa caa caa agc gat tta 480
 Gln Glu Arg Leu Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu

145	150	155	160	
gaa caa gag aga cgt gct aaa gaa aag ttg caa gaa caa caa agc gat				528
Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Ser Asp				
	165	170	175	
tta gaa caa gag aga cgt gct aaa gaa aag ttg caa gaa caa caa agc				576
Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Ser				
	180	185	190	
gat tta gaa caa gag aga cgt gct aaa gaa aag ttg caa gag cag caa				624
Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln				
	195	200	205	
aga gat tta gaa caa agg aag gct gat acg aaa aaa aat tta gaa aga				672
Arg Asp Leu Glu Gln Arg Lys Ala Asp Thr Lys Lys Asn Leu Glu Arg				
	210	215	220	
aaa aag gaa cat gga gat ata tta gca gag gat tta tat ggt cgt tta				720
Lys Lys Glu His Gly Asp Ile Leu Ala Glu Asp Leu Tyr Gly Arg Leu				
	225	230	235	240
gaa ata cca gct ata gaa ctt cca tca gaa aat gaa cgt gga tat tat				768
Glu Ile Pro Ala Ile Glu Leu Pro Ser Glu Asn Glu Arg Gly Tyr Tyr				
	245	250	255	
ata cca cat caa tct tct tta cct cag gac aac aga ggg aat agt aga				816
Ile Pro His Gln Ser Ser Leu Pro Gln Asp Asn Arg Gly Asn Ser Arg				
	260	265	270	
gat tcc aag gaa atg tct ata ata gaa aaa aca aat aga gaa tct att				864
Asp Ser Lys Glu Met Ser Ile Ile Glu Lys Thr Asn Arg Glu Ser Ile				
	275	280	285	
aca aca aat gtt gaa gga cga agg gat ata cat aaa gga cat ctt gaa				912
Thr Thr Asn Val Glu Gly Arg Arg Asp Ile His Lys Gly His Leu Glu				
	290	295	300	
gaa aag aaa gat ggt tca ata aaa cca gaa caa aaa gaa gat aaa tct				960
Glu Lys Lys Asp Gly Ser Ile Lys Pro Glu Gln Lys Glu Asp Lys Ser				
	305	310	315	320
gct gac ata caa aat cat aca tta gag aca gta aat att tct gat gtt				1008
Ala Asp Ile Gln Asn His Thr Leu Glu Thr Val Asn Ile Ser Asp Val				
	325	330	335	
aat gat ttt caa ata agt aag tat gag gat gaa ata agt gct gaa tat				1056
Asn Asp Phe Gln Ile Ser Lys Tyr Glu Asp Glu Ile Ser Ala Glu Tyr				
	340	345	350	
gac gat tca tta ata gat gaa gaa gaa gat gat gaa gac tta gac gaa				1104
Asp Asp Ser Leu Ile Asp Glu Glu Glu Asp Asp Glu Asp Leu Asp Glu				
	355	360	365	
ttt aag cct att gtg caa tat gac aat ttc caa gat gaa gaa aac ata				1152
Phe Lys Pro Ile Val Gln Tyr Asp Asn Phe Gln Asp Glu Glu Asn Ile				
	370	375	380	
gga att tat aaa gaa cta gaa gat ttg ata gag aaa aat gaa aat tta				1200

Gly	Ile	Tyr	Lys	Glu	Leu	Glu	Asp	Leu	Ile	Glu	Lys	Asn	Glu	Asn	Leu		
385					390					395					400		
gat	gat	tta	gat	gaa	gga	ata	gaa	aaa	tca	tca	gaa	gaa	tta	tct	gaa	1248	
Asp	Asp	Leu	Asp	Glu	Gly	Ile	Glu	Lys	Ser	Ser	Glu	Glu	Leu	Ser	Glu		
				405				410					415				
gaa	aaa	ata	aaa	aaa	gga	aag	aaa	tat	gaa	aaa	aca	aag	gat	aat	aat	1296	
Glu	Lys	Ile	Lys	Lys	Gly	Lys	Lys	Tyr	Glu	Lys	Thr	Lys	Asp	Asn	Asn		
			420					425					430				
ttt	aaa	cca	aat	gat	aaa	agt	ttg	tat	gat	gag	cat	att	aaa	aaa	tat	1344	
Phe	Lys	Pro	Asn	Asp	Lys	Ser	Leu	Tyr	Asp	Glu	His	Ile	Lys	Lys	Tyr		
		435					440					445					
aaa	aat	gat	aag	cag	gtt	aat	aag	gaa	aag	gaa	aaa	ttc	ata	aaa	tca	1392	
Lys	Asn	Asp	Lys	Gln	Val	Asn	Lys	Glu	Lys	Glu	Lys	Phe	Ile	Lys	Ser		
	450					455					460						
ttg	ttt	cat	ata	ttt	gac	gga	gac	aat	gaa	att	tta	cag	atc	gtg	gat	1440	
Leu	Phe	His	Ile	Phe	Asp	Gly	Asp	Asn	Glu	Ile	Leu	Gln	Ile	Val	Asp		
465				470					475					480			
gag	tta	tct	gaa	gat	ata	act	aaa	tat	ttt	atg	aaa	cta	taa	aag	gtt	1488	
Glu	Leu	Ser	Glu	Asp	Ile	Thr	Lys	Tyr	Phe	Met	Lys	Leu	*	Lys	Val		
				485				490						495			
ata	tat															1494	
Ile	Tyr																

<210> 47

<211> 497

<212> PRT

<213> Artificial Sequence

<220>

<223> Liver Stage Specific antigen

<400> 47

Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg	Ala	Lys	Glu	Lys		
1				5					10					15			
Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Asp	Arg	Leu	Ala	Lys	Glu		
			20					25					30				
Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Leu	Ala	Lys		
	35						40					45					
Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg	Ala		
	50				55						60						
Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu	Arg	Arg		
65					70				75					80			
Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Asp	Arg		
			85					90					95				
Leu	Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln	Glu		
		100						105					110				
Arg	Arg	Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu	Gln		
		115					120					125					
Glu	Arg	Arg	Ala	Lys	Glu	Lys	Leu	Gln	Glu	Gln	Gln	Ser	Asp	Leu	Glu		
	130					135						140					

Gln Glu Arg Leu Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp Leu
 145 150 155 160
 Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser Asp
 165 170 175
 Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln Ser
 180 185 190
 Asp Leu Glu Gln Glu Arg Arg Ala Lys Glu Lys Leu Gln Glu Gln Gln
 195 200 205
 Arg Asp Leu Glu Gln Arg Lys Ala Asp Thr Lys Lys Asn Leu Glu Arg
 210 215 220
 Lys Lys Glu His Gly Asp Ile Leu Ala Glu Asp Leu Tyr Gly Arg Leu
 225 230 235 240
 Glu Ile Pro Ala Ile Glu Leu Pro Ser Glu Asn Glu Arg Gly Tyr Tyr
 245 250 255
 Ile Pro His Gln Ser Ser Leu Pro Gln Asp Asn Arg Gly Asn Ser Arg
 260 265 270
 Asp Ser Lys Glu Met Ser Ile Ile Glu Lys Thr Asn Arg Glu Ser Ile
 275 280 285
 Thr Thr Asn Val Glu Gly Arg Arg Asp Ile His Lys Gly His Leu Glu
 290 295 300
 Glu Lys Lys Asp Gly Ser Ile Lys Pro Glu Gln Lys Glu Asp Lys Ser
 305 310 315 320
 Ala Asp Ile Gln Asn His Thr Leu Glu Thr Val Asn Ile Ser Asp Val
 325 330 335
 Asn Asp Phe Gln Ile Ser Lys Tyr Glu Asp Glu Ile Ser Ala Glu Tyr
 340 345 350
 Asp Asp Ser Leu Ile Asp Glu Glu Glu Asp Asp Glu Asp Leu Asp Glu
 355 360 365
 Phe Lys Pro Ile Val Gln Tyr Asp Asn Phe Gln Asp Glu Glu Asn Ile
 370 375 380
 Gly Ile Tyr Lys Glu Leu Glu Asp Leu Ile Glu Lys Asn Glu Asn Leu
 385 390 395 400
 Asp Asp Leu Asp Glu Gly Ile Glu Lys Ser Ser Glu Glu Leu Ser Glu
 405 410 415
 Glu Lys Ile Lys Lys Gly Lys Lys Tyr Glu Lys Thr Lys Asp Asn Asn
 420 425 430
 Phe Lys Pro Asn Asp Lys Ser Leu Tyr Asp Glu His Ile Lys Lys Tyr
 435 440 445
 Lys Asn Asp Lys Gln Val Asn Lys Glu Lys Glu Lys Phe Ile Lys Ser
 450 455 460
 Leu Phe His Ile Phe Asp Gly Asp Asn Glu Ile Leu Gln Ile Val Asp
 465 470 475 480
 Glu Leu Ser Glu Asp Ile Thr Lys Tyr Phe Met Lys Leu Lys Val Ile
 485 490 495
 Tyr